LHP 105

AUTOMECHANICS

The **LHP-105** laboratory covers all areas, theoretical and practical, concerning all **Automotive Engines** and **Automotive Sub-systems** included in various types of Automobiles. The laboratory consists of a set of simulators, trainers and equipment listed on the right of this page (any PCs required are not included - provided locally by reseller).
The laboratory is designed to provide students with automotive training program introducing various systems and components in modern cars. It brings a comprehensive view of the entire sub systems in the car, the system's components and their interconnection, functions, operation, signals, diagnosis and repair methods under hands-on safe activities.
The system includes all the necessary instruments as well as the sub-systems for execution of exercises and the experimental-practical exercise of the students. The individual simulation sub-systems are suitable vertical frames (Electronic boards and in cases of some Trainers and Simulation Trainers with actual automotive parts) so as students to be able to observe the circuits and the connections of the individual elements.
The laboratory's equipment is accompanied by the appropriate software to run interactively with PC workstations, wherever this is applicable. When an available program interfaces the PC with a simulator, it offers support in all the above training procedures and creates realistic simulations. The student is able to change the data and the parameters of the system. The programs present schematically the results of the adjustments performed by the student.
The software is organized in subjects corresponding to the simulations and the experimental exercises with scope:

- A series of aims for the specific experiment and the level of knowledge that must be obtained.
- Theoretical background relevant to the lesson as well as practical examples of use.
- Tests/Questions for the students and fault testing.

In general, a trainer is not a simulator but it consists of real equipment built with genuine components on an experimental platform.

On the other hand, a simulator is an educational system designed in metal vertical frame or bench-top block configuration, so the students have the capability to watch the theoretical and practical study of the **Auto mechanics** systems. It includes color mimic diagrams that clearly shows the structure of the system and allows the location of components on it. The display of the information available on the PC monitor allows the continuous monitoring of the didactic process. The operational conditions are entered by the students. The insertion of faults is carried out by either the software application or with switches. A simulator or a trainer is accompanied by relevant software to enable the student to follow step-by-step the theory and the exercise. The whole exercise procedure is carried out on the simulators. The system is accompanied by technical manuals for theory and exercises.

Each one of the lab equipment is described hereinafter. Theory concepts are on presented by the teacher in presentation slides and the system also offers a student response system (optionally) on theoretical and practical quizzes, tests or exams which also the teacher can create.

PT-AM31
Fuel Injection System

PT-AM06
Emission Control System

PT-AM32
Injection Control System

PT-AM20
Hybrid Automotive

PTS-3574
Car Air Conditioning & Climate Control Simulator

PTS-3577
Suspension Simulator

PTS-3578
Safety Systems Simulator

PTS-3579
Transmission Simulator

PT-2A
Electronic Multipoint Petrol Injection

PT-30
Chassis Front Wheel Drive Transversally Mounted Petrol Engine

PT-MEM 1000
Diagnostic Tester

PT-915
Injection Unit Demonstrator

HCM14
Automobile Working Model 1/2-cut

Automotive parts - Cut Models

PT-001
Steering And Suspension Model

PT-10
Diesel Engine Model

PT-11
Petrol Engine Model

PT-151
Automatic Gearbox - Crank Operated

PT-157
Hydraulic Control Clutch Section

PT-157-1
Hydraulic Control Clutch Cross Section

PT-172
Rack Power Steering Section Model

PT-214
Catalytic Silencer With Lambda Probe

PT-242
Air Compressor Cut Model

PT-1031
Single Body Carburetor

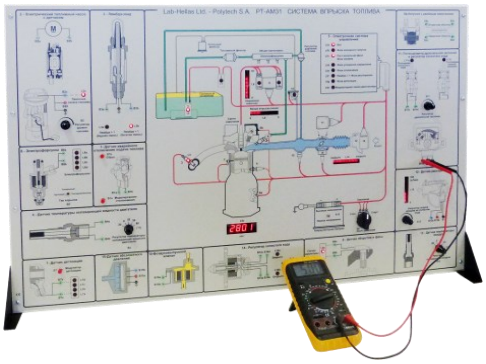
PT-1033
Vertical Twin Carburetor

PT-1034
Vacuum Carburetor

PT-1065
Air Conditioning Cut Model

PT-AM31 Simulator

Fuel Injection System



With the simulator it is possible to study engine operation, engine sensors and controls and electronic fuel injection.

The simulator covers the following topics:

- Oxygen sensor, temperature sensor, MAP sensor, MAF sensor, knock sensor, operation.
- Pressure, flow, position sensors.
- Injection time - calculation.
- Ignition pulses effect on main switch, ignition timings.
- Engine efficiencies, horsepower and engine torque, valve position switch output signals and valve position sensor output signals.
- Signal analysis, injector activation signal at various conditions, air injection control, injection duration at various speeds, temperatures and engine loads.
- Air temperature effect on the quantity of injected fuel.
- Fuel cut-off, relationship between the duration of injector opening to the quantity of injected fuel.
- Solenoids, open and close loop controls and exhaust gas circuit.

The simulator takes into consideration all these aspects by performing the following functions:

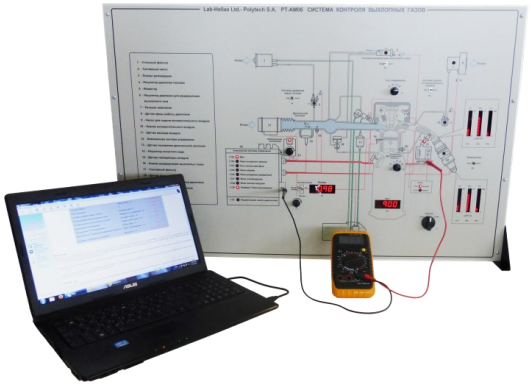
- Ignition phase
- Quick acceleration and deceleration phase;
- Regulation of the advance angle;
- Heating phase;
- Cut-off phase;
- Regulation of the minimum rpm;
- Lambda regulation;
- Regulation of the injection time;
- Regulation of the knock

The following automotive components are analyzed:

- Rpm/reference point sensors;
- Inertial sensor;
- Idle actuator;
- Level sensor;
- Electro-pump;
- Electro-injectors and coils.

PT-AM06 Simulator

Emission Control System



With the simulator it is possible to study how emissions are controlled in the modern vehicles.

The simulator covers the following topics:

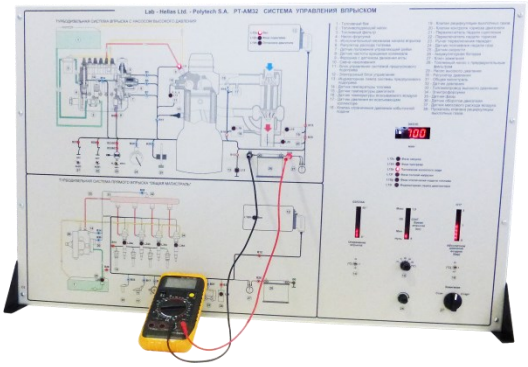
- Stoichiometric air/fuel measurement, early fuel evaporation, fuel control;
- Hydrocarbons, carbon monoxide and nitric oxides measurement (emissions), exhaust gasses (emissions) measurement;
- Idle air control, evaporation emission control;
- Exhaust gas sub-circuit, catalyst;
- Internal combustion engines, air preheat systems.

The simulator takes into consideration all the relevant subjects and in particular:

- Composition and control of the exhaust gases in the Otto cycle based engines;
- Combustion products;
- Preparation and control of the fuel and operating conditions;
- Adaptation to the operating conditions;
- Lambda regulation;
- Re-circulation of the exhaust gases;
- Anti-evaporation of the fuel;
- Catalytic thermal post-combustion;
- Analysis of the exhaust gases in the Otto cycle based engines: test cycles.

PT-AM32 Simulator

Injection Control System



With the simulator it is possible to study the control (diesel engine management) and the diesel engines direct injection (common rail direct injections).

The simulator covers the following topics:

- Heavy vehicle wiring diagram;
- Engine protection;
- Heavy vehicle Electronics Control Module (ECM);
- Tamper resistance;
- Fault finding;
- Heavy vehicle electronic fuel injection systems;
- Fuel tank with pre-filter;
- High pressure electro-pump;
- Heavy vehicle sensors;
- Flow limiter;
- Heavy vehicle exhaust gas analysis and management of emission control;
- Electronic control board for the whole plant;
- Heavy vehicle turbo chargers and blowers;
- Heavy vehicle cold start systems;
- 12V circuits;
- Electronic control of vehicle performance and speed;
- Engine rpm sensor;
- Accelerator pedal position sensor;
- Over-supply pressure sensor;
- Air temperature sensor, engine temperature sensor, air mass sensor.

PT-AM20 Simulator

Hybrid Automotive

With the PT-AM20 simulator it is possible to study all the operating characteristics of a **Hybrid system** that uses a parallel coupling between an internal combustion unit and a three-phase electric motor.

The subsystems that form the hybrid solution and that are analyzed by means of the simulator and shown on the synoptical panel are the following:

- **Gasoline Unit**, including:
  - Gasoline Engine, with a bank of 4 cylinders and multipoint sequential injection
  - i-DSI : Intelligent Double Sequential Ignition
  - i-VTEC : Intelligent Variable-valve Timing and Electronic-lift Control
  - Engine ECU (electronic control unit for managing the thermal motor)
- **Electric Unit**, composed of:
  - Synchronous Three-phase Electric Motor/Generator with permanent magnets
  - Eco Assist System
- **Continuously Variable Transmission (CVT)**
- **Dual-Scroll Hybrid A/C Compressor**
- **Intelligent Power Unit**, that includes:
  - Battery Module, composed of Ni-MH cells
  - Battery ECU, electronic control unit for managing and controlling the charging state (SOC) of the Battery Module
  - Cooling Fan, for cooling the battery module
  - Motor Control Module, for the synchronization of the electric motor with the petrol engine
  - Electric Power Unit, with inverter for power supplying the electric motor and AC/DC converter for the current supplied by the motor operating as a generator
  - DC Unit, it regulates the quantity of direct current at 12V supplied by the DC-DC converter
  - A/C Driver, for managing the Dual-Scroll Hybrid A/C Compressor

The simulator takes into consideration all these aspects by performing the following functions:

- Starting/Restarting Mode
- Low Acceleration Mode
- Low/Medium Cruising Mode
- Full Electric Mode
- Medium Acceleration/Assist Mode
- High Acceleration/Assist Mode
- High Cruising Mode
- Regenerative Deceleration Mode
- Regenerative Braking Mode
- Idle Stop & Go Mode
- ECO Mode

In particular, the following variables are analyzed and visualized:

- Active Mode
- Road Gradient
- Car Speed (km/h)
- Engine Speed (Rpm)
- Engine Temperature (°C)
- Ambient Meter
- SOC: State of charge (0 – 100 %)
- Battery cooling fan action
- Instantaneous Level of ASSIST
- Instantaneous Level of CHARGE
- Flow of Energy
- i-DSI sequence
- i-VTEC position
- Instantaneous fuel economy (l/100 km)
- Instantaneous CO_2 emission (g/km)
- Air Conditioner status
- Hybrid compressor action
- A/C set-point temperature
- Internal temperature
- External temperature
- Shift lever position
- Instantaneous Ratio of Transmission
- Drive Pulley action (widening/ narrowing)
- Driven Pulley action (narrowing/ widening)

Teacher and Students can operate on the following actuators to modify the relevant parameters:

- IGNITION SWITCH selector
- ENGINE START button
- ECO MODE button
- SHIFT LEVER, with RELEASE button, simulator (positions: P–R–N–D–S–L)
- ACCELERATOR PEDAL simulator
- BRAKE PEDAL simulator
- ROAD GRADIENT selector (0%; +5%; +15%; -5%; -15%)
- INFO LCD SHIFT button
- AIR-CONDITIONER ON/OFF button
- A/C SET-POINT TEMPERATURE potentiometer
- EXTERNAL TEMPERATURE selector

The type of faults and malfunctions that it is possible to insert through the software include:

- Starting malfunction
- Starting in cold weather fault
- Restarting malfunction
- Idle Stop & Go malfunction
- ECO mode malfunction
- Shift Lever malfunction
- Accelerator pedal fault and malfunction
- Brake pedal malfunction
- I-DSI malfunction
- I-VTEC fault and malfunction
- CVT malfunction
- Air-conditioner malfunction
- Fuel economy malfunction
- CO_2 emission malfunction
- Assist malfunction
- Charge malfunction
- SOC malfunction
- Regenerative deceleration fault
- Regenerative braking fault
- High cruising mode malfunction
- Electric mode malfunction

SOFTWARE

The simulator is provided complete with Training Software and Control Software. The Training Software guides the student through the following phases: learning, simulation and experiments performance, tests and troubleshooting. It represents the state of the art of the applications of Computer Aided Instruction, thanks to the use of the World Wide Web Internet technologies that are the most powerful and simple environment to be used for the distribution and utilization of multimedia and hyper textual components. With this software learning becomes as simple as surfing on the Internet.
The Control Software controls all the devices of the simulator and allows visualizing on suitable time based diagrams all the quantities of the system. It also provides a Car Panel that makes even more realistic the use of the simulator.

Required PC configuration

The simulator can be used with any Personal Computer having:

- Windows Operating System 7 or higher
- USB interface

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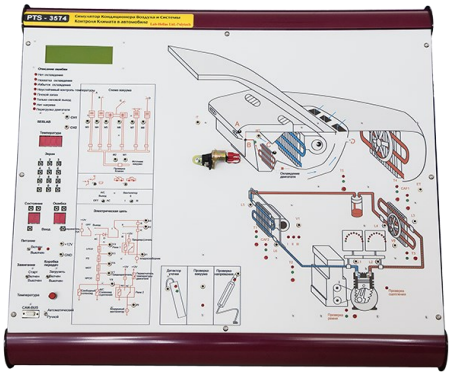
PTS-3574 Simulator

Car Air-Conditioning And Climate Control Simulator



TECHNICAL DESCRIPTION

The simulator is in a wide metal case with a colored printed circuit experiment panel (L:81 x H:73 x D:11 cm) which ensures easy handling and good visibility of the components simulation. The simulator includes real components and simulation components modules. The experimenting panel includes the system drawings with test points and banana sockets. The simulator can be operated as a stand alone system without a PC, guided by experimental book using its built in oscilloscope or an external oscilloscope. The simulator can be connected to a PC with serial communication (RS232 or USB) using courseware and software for signal display. Student PC can be connected to the teacher PC for monitoring, course management and records by software (optional).

The system includes:

- Power switch with indicating light;
- 2 channel digital oscilloscope;
- 7 segment display and control switches, one for fault insertion unit and one for selecting simulation mode;
- Eight (8) LEDs to indicate troubleshooting state;
- Status mode switches and display;
- Fault insertion switches and display;
- Warning indicating light;
- Graphic and Alphanumeric LCD display 64 x 240 pixels;
- Numeric keyboard;
- CAN-BUS Interface;
- Serial or USB communication interface with the PC;
- PC/MANUAL switch;
- 12V Power adapter with overload protection;
- Digital multimeter;
- Operating and simulation switches;
- Simulation potentiometers;
- Electric fan with speed regulator for climate control;
- External temperature sensor potentiometer simulation;
- Mixed air temperature sensor potentiometer and display simulation;
- Internal temperature sensor potentiometer and display simulation;
- Fuses and relays;
- Diagnostic sockets and testers;
- Compressor operation simulation;
- Condenser electric fan operation simulation;
- Minimum and maximum pressure transmitter sensor simulation;
- Ice state simulation;
- Distribution and regulation system of flow rate of mixed air simulation & Electronic control unit simulation for:
  - Control of air temperature at the required value» control of warm air/cold air mixing speed control of electric fan m control of mixed air distribution «control of air-circulation vent»;
  - Starting climate control system with cold engine;
  - Elimination of overloads on starting engine;
  - Self-diagnostics warning lights *Key switch.
- Remote control switch for controlling fan and electromagnetic coupling.

EXPERIMENTS

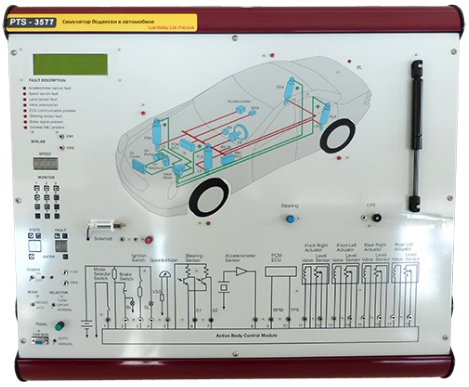
This system enables the student to perform experiments and covers the following topics:

- Refrigeration circuit components;
- Temperature and pressure characteristics;
- Cooling circuit gas pressure control;
- Condenser fan control;
- Electronic temperature regulation;
- Air distribution control with vacuum valves;
- Air distribution control with stepper motors;
- Fan speed control with electronic switching regulation;
- Climate control automatic and manual operation in relation to external, mixed and internal temperature analysis;
- Various operating conditions and their effect on the climate control system;
- Automatic operation of the system in relation to external, mixed and internal temperature as well as analysis of manual operation with setting of internal temperature and speed of electric fan;
- Checking the operating conditions: with cold start of air recirculation, the direction of air in relation to the position of distribution opening;
- Connecting and disconnecting conditions of the electric fan on the condenser and of the simulated compressor;
- Choosing of air recirculation, un-fogging function and economic cycle;
- Troubleshooting and maintenance.

An experiment manual for the student and instructor manual accompany the system.

PTS-3577 Simulator

Suspension Simulator



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The simulator can be operated as a stand alone system without a PC, guided by experimental book using its built in oscilloscope or an external oscilloscope. The simulator can be connected to a PC in serial communication (RS232 or USB) using courseware and software for signal display.
Student PC can be connected to the teacher PC for monitoring, course management and records by software (optional).

The system includes:

- A power switch with indicating light;
- 2 channel digital oscilloscope;
- 7 segment display and control switches, one for fault insertion unit and one for selecting simulation mode;
- Eight (8) LEDs to indicate troubleshooting state;
- Status mode switches and display;
- Warning indicating light;
- Graphic and Alphanumeric LCD display 64 x 240 pixels;
- Numeric keyboard;
- CAN-BUS interface;
- Serial or USB communication interface with the PC;
- PC/MANUAL switch;
- 12V Power adapter;
- Digital multimeter;
- Operating and simulation switches;
- Simulation potentiometers;
- Shock absorber unit Simulation;
- Accelerometer simulation;
- Braking pressure sensor with simulating unit;
- Gear ratio sensor with simulating unit;
- Steering angle and speed with simulating driving device;
- Simulating modules for engine butterfly valve sensor and its operation, electrical-electronic system shock absorbers controlled by microcontroller, remote control switch for shock absorbers solenoid valves, RPM sensor.

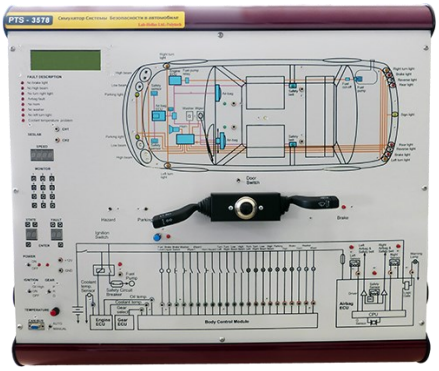
EXPERIMENTS
This system enables the student to perform experiments and covers the following topics:

- Introduction to modem car suspension system, construction, sensors and operation;
- Accelerometer sensor signal analysis;
- Logic intervention in relation to the vertical acceleration;
- Steering sensor signal analysis;
- Logic intervention in relation to the steering angle and to the car speed;
- Logic the intervention in relation to the gear selected, to the acceleration, and to the car speed;
- Logic intervention in relation to the braking pressure;
- Logic intervention in relation to the steering speed and to the car speed;
- The driving signal of the shock absorbers solenoid valves analysis (waveform and duration);
- Insertion of non-destructive faults and troubleshooting and analysis of irregularities and operational defects, by means of microprocessor fault simulator faultfinding methods with various instruments.

An experiment manual for the student and an instructor manual accompany the system.

PTS-3578 Simulator

Safety Systems Simulator



TECHNICAL DESCRIPTION

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The simulator includes real components and simulation components modules. The experimenting panel includes the system drawings with test points and banana sockets.

The simulator can be operated as a stand alone system without a PC, guided by experimental book using its built in oscilloscope or an external oscilloscope. The simulator can be connected to a PC in serial communication (RS232 or USB) using courseware and software for signal display.

Student PC can be connected to the teacher PC for monitoring, course management and records by software (optional).

The system includes:

- A power switch with indicating light;
- 2 channel digital oscilloscope;
- 7 segment display and control switches - one for fault insertion unit and one for selecting simulation state;
- Eight (8) LEDs to indicate troubleshooting state;
- Status mode switches and display;
- Warning indicating light;
- Graphic and Alphanumeric LCD display 64 x 240 pixels;
- Numeric keyboard CAN-BUS interface;
- Serial or USB communication interface with the PC/ MANUAL switch;
- 12V Power adapter;
- Digital multimeter;
- Operating and simulation switches ;
- Simulation potentiometers;
- Lighting system simulation for Head lights, Parking lights, Interior lights, Rear lights, Reversing Light, Turn signaling system;
- Windshield wipers & Washer system modules;
- Airbag simulator with electronic control unit and date accelerometer, moving sensors and pneumatic valve warning light for self-diagnostic;
- Pre-tension actuator of safety belts-operation simulator (test key);
- Collision simulator;
- Warning light signaling the intervention of belt;
- Safety tension belts system simulation with Electronic control unit;
- Fuel cut-off system simulation with the following components:
  - Inertial switch for fuel shut-off;
  - Simulator of electric fuel pump;
  - Anti-tilting valve for fuel shut-off;
  - Simulator of fuel tank of transparent plastic material;
  - Fault simulator: microprocessor controlled to insert 8 faults.

EXPERIMENTS

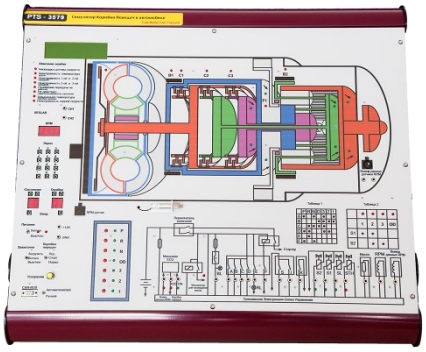
This system enables the student to perform experiments and covers the following topics:

- Main head lights;
- Parking lights, Rear lights;
- Turn signaling lights, Reversing lights, Stop lights, Hazard lights;
- The Interior Lighting system;
- Electrical Horns;
- Wipers and Washer system;
- Airbag Electronic Control Unit;
- Shock sensors;
- Safety belt tightening;
- Inertia L security switch;
- Fuel leakage security valve;
- Sensors and indicators: Fuel level, Reserve gear, Oil pressure, Coolant temperature, Brake fluid level and warning light.

An experiment manual for the student and an instructor manual accompany the system.

PTS-3579 Simulator

Transmission Simulator



TECHNICAL CHARACTERISTICS

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The simulator can be operated as a stand alone system without a PC, guided by experimental book using its built in oscilloscope or an external oscilloscope. The simulator can be connected to a PC in serial communication (RS232 or USB) using courseware and software for signal display.
Student PC can be connected to the teacher PC for monitoring, course management and records by software (optional).

The system includes:

- A power switch with indicating light;
- 2 channel digital oscilloscope;
- 7 segment display and control switches, one for fault insertion unit and one for selecting simulation mode;
- Eight (8) LEDs to indicate troubleshooting state;
- Status mode switches and display ;
- Warning indicating light;
- Graphic and Alphanumeric LCD display 64 x 240 pixels;
- Numeric keyboard;
- CAN-BUS interface;
- Serial or USB communication interface with the PC;
- PC/MANUAL switch;
- 12V Power adapter;
- Digital multimeter;
- Operating and simulation switches;
- Simulation potentiometers;
- Indicator lights for selection of transmission gears, solenoid valves, pressure-modulating control, signal of torque conversion;
- Display for selecting lever, selection of programs and alarms;
- Remote control switch for the electric fan of oil cooler on automatic transmission;
- Electric fan for the oil cooler on automatic transmission;
- Simulator of the signal of transmission revolutions and/ or car speed;
- Micro switch for sending the signal of gear clutched to the electronic control unit of injection and ignition;
- Indicator light for the signal of torque reduction for electronic control unit of injection and ignition;
- Simulator for the signal of opening of butterfly valve and engine temperature;
- Simulator for the engine load signal;
- Simulator for the engine rpm signal;
- Oil temperature and associated sensor simulator.

EXPERIMENTS

This system enables the student to perform experiments and covers the following topics:

- Introduction to Automatics transmission;
- Changing gears characteristic curves analysis through 4 gears in relation to output speed of transmission;
- The butterfly valve and its opening angles;
- Transmission operating programs;
- The combinational commands of the transmission solenoid valves in relation to the various gears and clutches;
- Analysis of pressure control and optimization of clutch times in relation to:
  - Engine rpm type of gearing;
  - Opening of the butterfly valve;
  - Engine load;
  - Output speed of transmission;
  - Difference of rpm at Hie clutching time;
  - Insertion of non-destructive faults and troubleshooting.

An experiment manual for the student and an instructor manual accompany the system.

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PT-2A Trainer

Electronic Multipoint Petrol Injection

Sequential multipoint gasoline injection and ignition system.

This system can be used for the control of four-cylinder engines with sequential fuel injection and static ignition, and it is also equipped with an electronic unit included in a multiplex CAN network between the dashboard and the body computer, to minimize the wiring and ensure a high reliability.

TRAINING PROGRAM

- Analyzing the control of injection times according to:
  - the number of revolutions;
  - the temperature of the engine;
  - the engine load;
- Analyzing the control of ignition angle;
- Check of the intervention of the non-evaporation valve depending on the conditions of engine load;
- Analyzing the waveform of the signal enabling the motor-driven throttle valve;
- Analyzing the waveform of the signals coming from the r.p.m. sensor on the driving shaft, and of the phase sensor on the camshaft;
- Checking the conditions for the fuel cutoff;
- Analyzing the various operating conditions and phases;
- Analysis of the control of injection according to the oxygen sensors before and after the catalytic converter;
- Analyzing the physical line of the CAN bus between control unit, Body Computer and dashboard in the various cases of short circuit;
- Analyzing the malfunctions provoked by the fault insertion.

TECHNICAL SPECIFICATIONS

This Trainer consists of the following circuits and apparatuses:

- Fuel feeding circuit:
  - Tank of transparent Plexiglas;
  - Motor-driven pump with its own driving relay;
  - In-line filter with pulsation dampening;
  - 4 injectors with manifold of transparent Plexiglas;
  - Solenoid valve for re-circulating fuel vapors;
  - Double Lambda sensor for reducing pollution and controlling the catalytic converter.
- Air feeding circuit:
  - Sensor for the pressure of in-taken air with its own simulator;
  - Sensor for the temperature of the engine with its own simulator;
  - Potentiometer of the accelerator pedal for setting the engine load;
  - Motor-driven throttle valve for the automatic control of the air;
  - intake in the engine collector.
- Ignition circuit:
  - 4 spark plugs;
  - Static ignition coil;
  - Protection against high voltages and access for current clamps.
- Electric-electronic equipment:
  - Ignition key with locking system;
  - Electronic control unit for a good operation of the system;
  - Body computer for controlling the CAN network and the diagnostic line via OBD connector;
  - Complete dashboard connected via multiplex CAN network;
  - Key for selecting the air-conditioning unit;
  - Simulator of the safety pressure switch of the refrigerant R134a.
- Engine equipment
  - Flywheel of the driving shaft with magnetic sensor;
  - Phase wheel of the camshaft with Hall-effect sensor;
  - Electric motor with electronic operation for simulating the revolutions of an endothermic engine, with a potentiometer;
  - Potentiometer for setting the speed of the vehicle;
  - Complete dashboard connected via CAN network.

All the components of circuits and equipment are mounted on a large vertical panel of silk-screen-printed aluminum including:

- Diagram of the system for an easy location of its components and of their connections;
- Test points (measuring jacks - Ø 4 mm) on all the connections of the electric components, for a thorough monitoring of the system;
- Microprocessor fault simulators, especially designed to enable the teacher to insert various types of faults in the system and then to assess the troubleshooting processes carried out by the student with the proper instruments. The system can restart its right operation only after the student has typed the code of the faulty component using the same simulator.

GENERAL CHARACTERISTICS

This trainer is mounted on wheels and it includes a working top and a locked drawer.

POWER SUPPLY

- 115/230 VAC, ± 10 %, 50/60 Hz;
- Magneto thermal differential switch with warning light;
- Service outlet;
- Emergency stop pushbutton.

OPERATING VOLTAGE

- 12 V dc generated by a battery;
- Battery charger.

HANDBOOKS

The Trainer is equipped with the following handbooks:

- Operational handbook for installation and maintenance;
- Handbook of theory and exercises;
- Handbook of fault insertion and troubleshooting.

OPTIONS

- **Interactive software mod. SW-TAT**

This software can be used on a PC connected to the Trainer via a suitable serial interface (included in the Trainer). It enables:

  - The student to carry out interactive experiments the component, circuit or system under examination, including fault-finding;
  - The lecturer to gather data on student's activities.

- **Diagnostic tester mod. PT-MEM**

This professional portable station for fault finding can be used for:

  - Reading and display engine parameters reading and display faults;
  - Erasing memorized faults;
  - Activation of actuators.

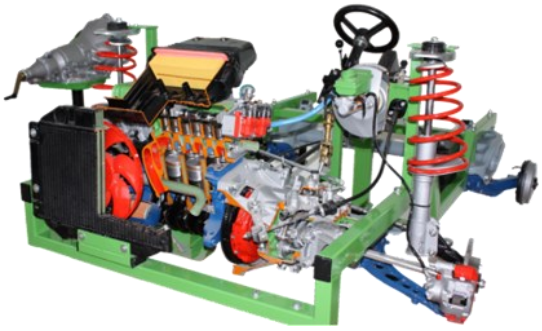
This diagnostic tool is provided with complete memory card Database.

- **Computerized measures mod. CME**

This software package is provided in order to connect PC with diagnostic tool mod. PT-MEM using serial port. The PC monitor screen displays engine control parameters in real time and values evolutions on four multi-color graphic curves.

PT-30 Trainer

Chassis Front – Wheel Drive Transversally Mounted Petrol Engine



* On wheel stand
* Accurately painted in several colors and shades to highlight various components, cross section cuts, feeding lubrication, cooling circuits etc.
* Electric motor operation

Dimensions

* Approx. 150 x 120 x 80 cm
* Weight approx. : 290kg
* 220V main supply.

Technical Features

* 4-stroke 4-cylinder engine 1800cc
* Timing system : double camshaft on
* Head controlled by positive drive belt
* Electronic ignition
* Multipoint electronic injection
* Gear 5D+R with integrated differential
* Rack work drive box
* McPherson front suspensions
* Rear suspensions damper and leaf spring
* Front disk, brake/rear drum brake
* Double circuit brake pump
* Controls in dashboard complete with pilot lamps

Electrical system complying with CE standards.

PT-MEM 1000 Tester

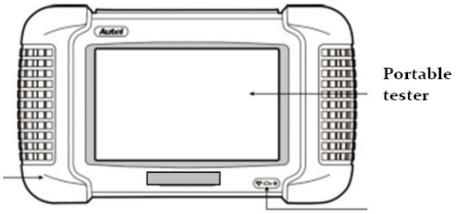
Diagnostic Tester

Diagnostic module PT–MEM1000 fulfills all the diagnostics tasks for the whole series of automotive trainers which are described in details in LHP Automotive Labs. The tester can be used with a laptop or a PC.

Can be used for:

✓Reading and display engine parameters
✓Reading and display faults
✓Erasing memorized faults
✓Activation of actuators.

Power supply and power cables



PT-MEM1000 is a set of:

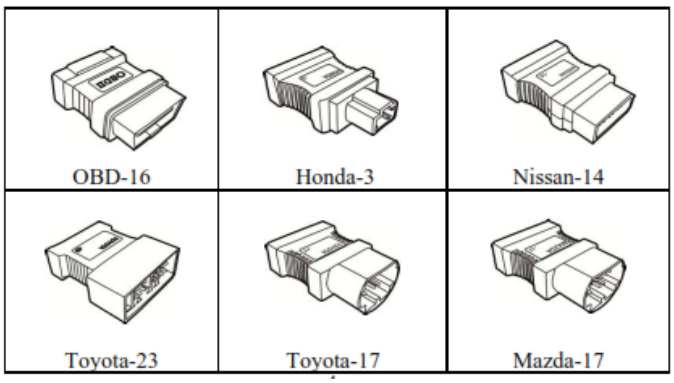
1.Portable tester
2.Memory card with a diagnostic base.
3.Set of cables for testing and displaying the information.
4.Power supply and power cable
5.A case for carrying
6.A handbook of possible tests.
7.Software for interaction with a PC, acquiring, displaying and printing out the data, carrying out remote tests, replaying the tests, connecting to a PC via Wi-Fi, etc.
8.User's manual for using PT-MEM1000 with LHP 105 lab, laboratory trainers PT-2A, PT-5 and HCM14.

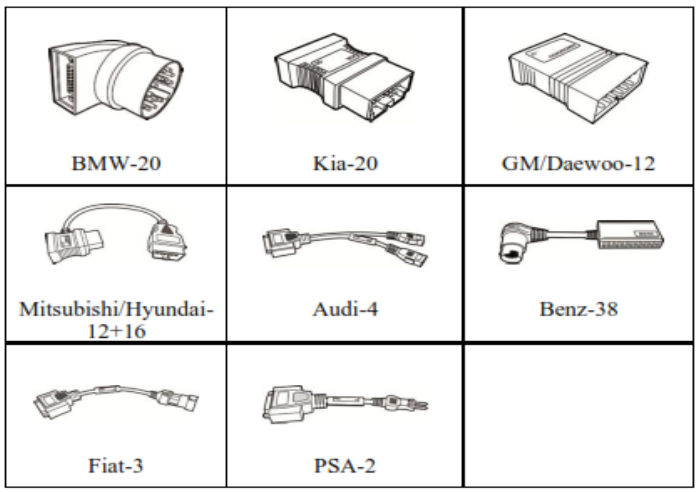
PT- MEM1000 is compatible with the most of the vehicle brands.

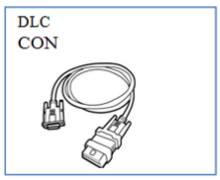
Diagnostic process:

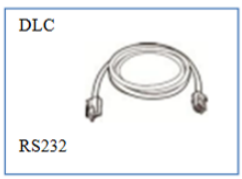
✓Displaying electronic control panel in real time.
✓Displaying faults in real time.
✓Erasing stored faults.
✓Managing drives.
✓Network data bus (CAN) with a certain rendering configuration.
✓The master node (ECU) with visualization.
✓Hardware stimulator via a network data bus.

OBD I





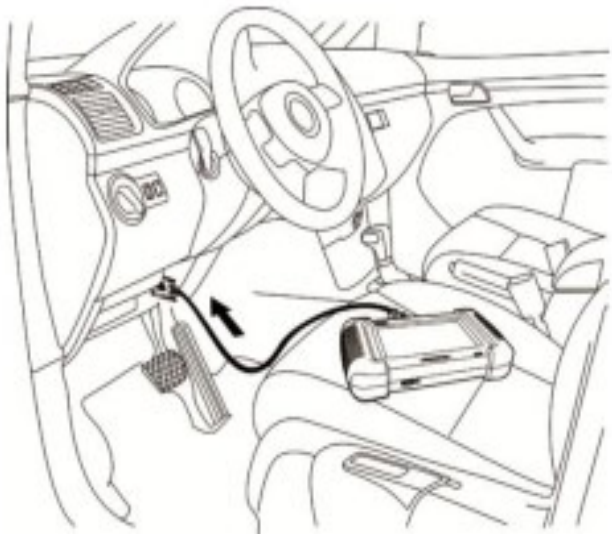




PT-MEM 1000 Tester

Specifications Portable tester

Operating System:	Windows CE
CPU:	ARM9+ARM7 dual processor
Memory:	4 Gigabyte SD card
Display:	7'' color display TFT (800*480 dpi) with resistive touch panel
Communication Interface:	Ethernet port 10/100, WLAN 802.11 b/g
Communication Interface:	8.0-32.0V power provided via vehicle battery
Operating Temperature:	0 – 60 °C (32 – 140 °F)
Storage Temperature:	-10 – 70 °C (14 – 158 °F)
Printer Interface:	Wi-Fi, USB, Ethernet
Dimensions:	282 mm (11.10") * 164 mm (6.42") * 60 mm (2.36")
Weight:	1.1 kg (2.95 oz)
Protocols:	ISO 9141-2, K/L lines, flashing code, SAE-J1850 VPW, SAE-J1850 PWM, CAN ISO 11898, ISO15765-4, High-speed, Middle-speed, Low-speed and Single-wire CAN



Package list
Main unit
Stylus
SD memory card
Case
Adaptors
Cables
Main cable
Cigarette lighter cable
Clipper Cable
Accessories
AC/DC Power Adapter
RS232 Serial Cable
SD memory card
Lighter Fuse 6*30 mm
User's Manual
Quick guide

PT-915 Demonstrator

Injection Unit Demonstrator

This is Model simulator sub unit composed of sectioned parts, cut and colored for internal detail observation and it demonstrates the design of a fuel Injection unit of an automobile. The trainer sits on a base.

HCM14 Demonstrator

Operational car - Automotive Working Model 1/2-cut

OBJECTIVE
To offer a hands-on training on a real Operational 1:1 scale car model with built in Fault ECU simulator and Diagnostic tools for complete Automotive and Auto electrical maintenance and service training.

Note: HCM line of products is based on operational cars, cut and reassembled in such form that can not be driven. The base of the HCM 14 can vary from different manufactures as VW, SKODA, OPEL, RENAULT, TOYOTA or other car makers subject to availability.

GENERAL DESCRIPTION
- **Fully functional original car.** The car is a fully functional car, but is immobilized. It offers all the running systems of the original car, as it comes from the manufacturer and it provides a full testing platform for all its mechanical and electrical systems.
- **The HCM14 is based on VW POLO 1.4cc engine with a 5 gear manual gearbox or the SKODA Fabia 14i.** All its parts and components are fully described in the original manufacturers documentation accompanying this product with schematics and detailed specifications.
- **For safety reasons the front wheel drive is interrupted** thus the car is immobilized (can not be driven).
- **Original diagnosis socket (16pin).** All faults are diagnosed from the cars original diagnostic sockets with specific pin outs for assisting the student to understand the fully service and maintenance process of a modern car. The ECU unit of the car is fully functional.
- On the back of the cut car Castor **wheels with brakes and brake lights** are installed for the maneuverability of the car in side the auto mechanics laboratory. The brake lights are there to simulate the rear brake lights.
- Also, the back panel includes the **rear braking light**, the license plate lights, the electrical doors of the back doors and the back windshield wiper.

OPERATIONAL PARAMETERS
The car's engine is supplied with Fault Insertion Board **FSB 155**. This allows a range of open circuit and high resistance faults to be inserted by the instructor to the ECU unit and the students must diagnose. A variety of these faults can be inserted and a systematic maintenance service procedure is followed in order to diagnose and troubleshoot the problems.
The car is specifically designed to aid teaching diagnostics, fault finding and troubleshooting.

FSB155 - FAULT SIMULATION BOARD
The fault simulator is integrated to the car and includes minimum **155 Error Switches** which assist to simulate all possible faults that the ECU can produce from the teacher console. The console includes the following components:
1. Potentiometer 10 kΩ: regulable resistance min. 2 Watt
2. Potentiometer 50 kΩ: regulable resistance min. 2 Watt
3. Potentiometer 100 kΩ: regulable resistance min. 2 Watt
4. In/output connectors: connection of the FSB between the wiring harness and the engine computer by using the correct adapter cable
5. 155 terminals in Black contact bus (1-155): connection with wiring harness / engine
6. 155 terminals Red contact bus (1-155): connection with the engine computer
7. 155 On/Off switches (1-155): switch to interrupt the ECU circuits
8. Switch pulse generator: switch for various pulse generator output signals
9. Red led 12 Volts (2x)
10. Pin number ECU-connector
11. Anodized alum Front plate (electrically isolated)

The fault simulator is easily integrated and disconnected from the car. It is based and fitted on a movable trolley (dimensions: L:485 x W:370 x H:910 mm) with 2 storage selves for the auxiliary equipment, a cabinet space to store the Fault Simulator board and a lock for safe keeping of the equipment. On its top it has 2 fittings to install the Fault Simulator board.
The FSB 155 is connected via a Pin-Box with 4mm-terminals and cables and the appropriate connectors having with direct access to the pins, required for the lessons, on the engine control unit ECU. Diagnostic sockets are fitted to the engine rigs as appropriate. The Fault Board is pre-wired and installed. Includes on/off switches and potentiometers for different tests.
Schematics and fault directions are supplied for detail understanding of the diagnosis and troubleshooting process.
The engine rigs offers an enhanced training resource, hands-on training with real components, as 1:1 scale demonstrator.
The Instructor can make up his own fault simulation very easily, using the FSB 155 and inserting various others faults he wants to instruct his students on.
It offers to the student the real time training without the constraints of a simulator or modular systems, by offering **one car system at site**.
The FSB 155 can simulate **systematic car faults**. Depending on the ECU pin-out, the FSB is possible to simulate all faults associated with each pin of the ECU.
In HCM 14 there are simulated faults instructions using the **Error Switches which assist to simulate faults, as for example:**
1. Open circuit mass of the accelerator pedal position (APP) sensor
2. Open circuit mass of the clutch pedal position (CPP) switch
3. Open circuit mass of the heated oxygen sensor (HO2S) 1
4. Open circuit mass of the heated oxygen sensor (HO2S) 2
5. Open circuit mass of the brake pedal position (BPP) switch
6. Open circuit mass of the evaporative emission (EVAP) canister purge valve
7. Open circuit mass of the fuel pump (FP) relay
8. Open circuit mass of the throttle position sensor
9. Open circuit mass of the throttle motor
10. Open circuit mass of the intake air temperature (IAT) sensor
11. Open circuit mass of the camshaft position (CMP) sensor
12. Open circuit mass of the crankshaft position (CKP) sensor
13. Open circuit mass of the injectors each cylinder
14. Open circuit mass of the engine coolant temperature (ECT) sensor
15. Open circuit mass of the ignitions

HCM14 Demonstrator

Operational car - Automotive Working Model 1/2-cut

amplifier each cylinder
16. Open circuit mass of the manifold absolute pressure (MAP) sensor
17. Open circuit mass of knock sensor (KS)
18. Open circuit mass of the exhaust gas recirculation (EGR) valve position sensor
19. Open circuit mass of the exhaust gas recirculation (EGR) valve actuator
20. Open circuit mass of alternator

ADDITIONALLY

*** Diagnostic electronic hand held terminal**

The HCM 14 comes with a Diagnostic electronic hand held terminal, to be used by the students on the 16 pin outlet of the ECU after the instructor inserts faults. By using the diagnostic protocol, it allows the user to access almost all the systems. It is small, robust, affordable and easy to use.

Features

- Reads and erases Diagnostic Trouble Codes (DTCs) of almost all the systems
- Turns off MILs of engine, airbag, ABS, A/T and most other systems
- Resets Oil Service Light, service mileage and service intervals
- Replaces and recalibrates brake pads safely
- Supports ALL 10 test modes of the latest OBD test specs including: Read Codes, Erase Codes, Live Data, Freeze Frame, I/M Readiness, O_2 Mon.Test, On-Board Mon.Test, Component Test and Vehicle Information
- Data graphing
- Troubleshooter codes tips the user to the root cause of trouble code faster, saving diagnosis time
- Can print data via PC

Specifications

- Display: TFT color display (320 x 240 dpi)
- Operating Temperature: 0 to 60°C (32 to 140 °F)
- Storage Temperature: -20 to 70°C (-4 to 158 °F)
- External Power: 12.0 to 18.0 V power provided via vehicle battery
- Dimensions (LxWxH): 199x104.5x37.5mm
- Weight: 0.28kg(without wire),0.484kg (with wire)

The system can be offered using also PT-MEM 1000, as a more high-end diagnostic device.

*** Oscilloscope**

The HCM 14 comes with a hand held Oscilloscope terminal and a Multimeter to be used by the students to make measurements with these instruments in various diagnostic process where they are needed and according to instructions.

Specifications

- Bandwidth: up to 10 MHz (-3dB or -4dB at selected ranges)
- Input range: 1mV to 20V/division in 14 steps
- Input coupling: DC, AC and GND
- Real-time sample rate up to 40MS/s
- AD resolution: 8 bits
- Time base: 250ns to 1h per division
- Auto set-up function (or manual)
- Probe x10 readout option
- Readouts: DC, AC & DC, True RMS, dBm, Vpp, Min-Max. (±2.5%)
- Audio power measurement from 2 to 32 ohms
- Hold & store function
- Time and Voltage markers readout
- Max. 100Vp AC+DC
- White LED backlight
- Operates on NiMH rechargeable battery pack (included)
- Operates up to 6 hours on one charge (It is not recommended to use the device while using the USB charger-otherwise, the user should use a standard 9VDC mains adaptor)
- Charging power supply: 9Vdc/200mA
- Dimensions: 74 x 114 x 29mm
- Extra Features: Audio Power measurement

Features

- 40Mega samples/sec in real time
- Full auto range option
- Sensitivity down to 0.1mV
- Signal markers for amplitude and time
- Memory Hold function
- USB battery charger included

*** Digital Multimeter**

Specifications

- DC Voltage: Range: 200mV-1000V, Accuracy:±(0.5%+1dgt)
- AC Voltage: Range:20V-750V,Accuracy: ±(0.8%+3dgt)
- DC Current: Range: 20mA-20A, Accuracy:±(0.8%+1dgt)
- AC Current: Range:200mA-20A, Accuracy: ±(1.8%+3dgt)
- Resistance: Range:200Ω-200MΩ, Accuracy:±(0.8%+1dgt)
- Capacitance: Range:2nF-20μF, Accuracy: ±(2.5%+3dgt)
- Frequency: Range:2KHz-20KHz, Accuracy: ±(1.5%+5dgt)
- Temperature: Range:-40°C~1000°C, Accuracy:±(0.75%+3dgt)
- Diode Test: Yes
- Transistor Test: Yes
- Continuity Buzzer: Yes
- Auto Power Off: Yes
- Data Hold: Yes
- Logic Test: Yes
- Power Supply: 9V Battery
- Maximum Display: 1999
- Product Net Weight: 300g
- Products Size: 191x89x35mm

HCM14 MODEL SPECIFICATIONS

Dimensions & Weight:

Length	2600 mm
Width	1682 mm
Height	1453 mm
Wheelbase	2456
Ground Clearance	168mm
Gross Weight	750 Kg

Engine specifications

Type	4 cylinder inline
Displacement	1398 cc
Fuel Type	Petrol
Max Power	75 bhp
Max Power @ RPM	5400 RPM
Max Torque	110 Nm
Max Torque @ RPM	3750 RPM
Mileage (ARAI)	16.47 kmpl
No of Cylinders	4 Cylinders
Cylinder Configuration	Inline
Valves per Cylinder	4 Valves
Transmission Type	Manual
No of gears	5 Gears
Drivetrain	FORWARD

PT-001 Trainer

Steering And Suspension Model

Fully operational, self contained Steering and Suspension trainer. Manufactured using original components and arranged as per the original vehicle. Suitable for all manufacturers' alignment test procedures. The steering and suspension trainer comes complete with sub frames, torsion bar, wishbones, suspension legs, front hub assembly and rack and pinion steering rack.

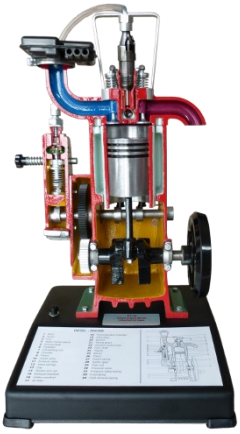
The trainer comes with a power steering rack, fully operational driven by a 1.2kW electric motor, a facility to load the suspension via jacks beneath the road wheels and a complete steering column and steering wheel. The Steering and Suspension trainer offers an enhanced training resource, hands on training with real components, greater understanding for the student without the constraints of the modern motor vehicle.

Requirements and Dimensions

* 240V AC supply required for power steering pump
* Dimensions approx.: W:90 x L:150 x H:120 cm
* Weight approx. : 260 kg

PT-10 Trainer

Diesel Engine Model



* Four – Stroke
* Full size sectioned model
* Hand crank operation
* Indirect injection
* Injection pump and injector
* Pre-combustion chamber
* Pre-heating glow plug
* Cooling system
* Distribution circuit
* During expansion phase the ignition of the fuel is simulated by lighting of a small bulb by push-button

Base Dimensions

* Dimensions approx. : 25 x 25 x 50 cm
* Weight approx. : 8 kg

PT-11 Trainer

Petrol Engine Model

* Four – Stroke
* Full size sectioned model
* Hand crank operation
* Cooling system
* Carburetor
* Coil ignition
* Distributor
* Spark plug coil
* Explosion stroke simulated by small bulb lighting

Base Dimensions

* Dimensions approx. : 30 x 25 x 60 cm
* Weight approx. : 9 kg

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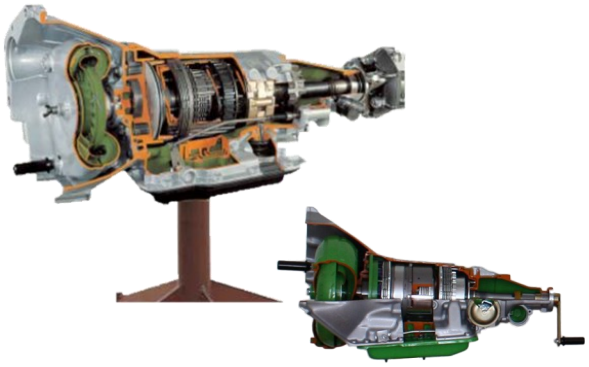
PT-151 Trainer



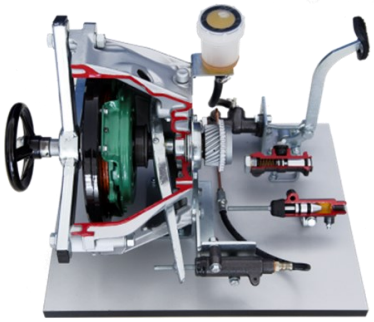
Automatic Gearbox - Crank Operated
(3 speed and reverse)

Composed by :
- Hydraulic torque converter
- Hydraulic valves
- Epicyclic gear change
- Multi-plate clutches
- Braking system
- On stand with wheels

Hand crank operation :
- Dimensions approx. : 80 x 30 x 30 cm
- Weight approx. : 90kg

PT-157 Trainer

Hydraulic Control Clutch Section



Composed by :

* Diaphragm clutch
* Pump
* Cylinder
* Clutch fully sectioned

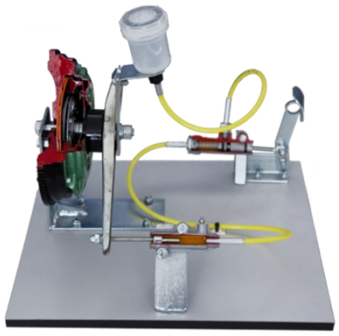
Base Dimensions

* Dimensions : 53 x 43 x 45 cm
* Weight : 27 kg

polytech

PT-157-1 Trainer

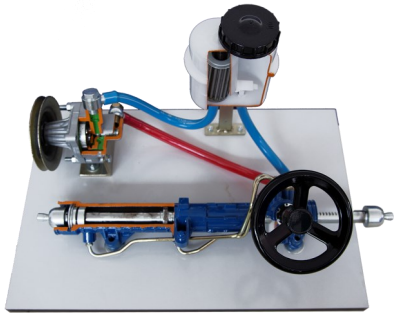
Hydraulic Control Clutch Cross Section



* This panel shows the hydraulic circuit controlling a diaphragm clutch.
* The pump, cylinder and clutch units are fully sectioned.
* Product size : 53 x 43 x 45 cm
* Weight : 16 Kg

PT-172 Trainer

Rack Power Steering Section Model



* Power steering hydraulic circuit.
* Provided with rack type steering box, hydraulic pump, oil tank relevant filter and connecting pipes.
* All parts are carefully sectioned to show every detail.
* Operated by hand through a hand wheel.
* Mounted on a base.
* Product size: 63 x 43 x 42 cm
* Weight :11 Kg

PT-214 Trainer

Catalytic Silencer With Lambda Probe

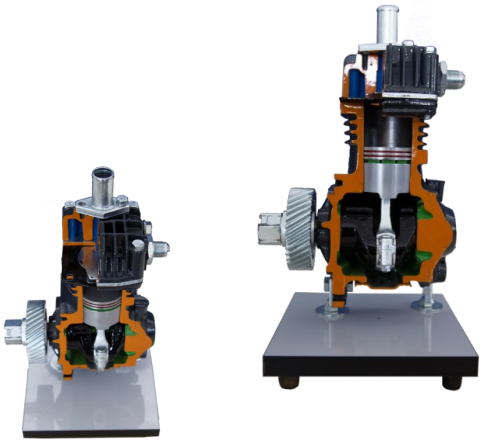
Shows the parts of the catalytic silencer with lambda probe.

Base Dimensions

* Dimensions approx : 40 x 25 x 15 cm
* Weight approx. : 15kg

PT-242 Trainer

Air Compressor Cut Model



An air compressor to be used for Pneumatic operations within the lab.

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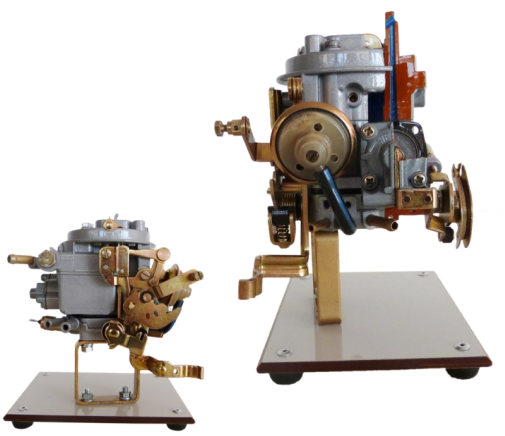
PT-1031 Trainer

Single Body Carburetor



* All its parts are sectioned to show the components consisting it.
* Mounted on a base.
* Product size : 17 x 13 x 20 cm
* Weight : 1,5 Kg

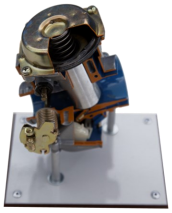
PT-1033 Trainer

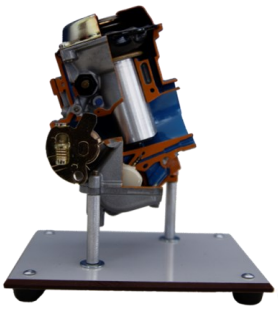
Vertical Twin Carburetor

* All its parts are sectioned to show the components consisting it.
* Mounted on a base.
* Product size: 18 x 20 x 20 cm
* Weight: 3 kg

PT-1034 Trainer

Vacuum Carburetor

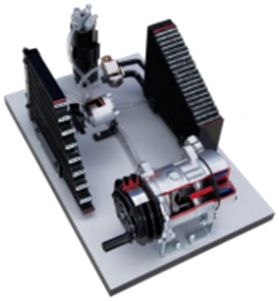




* All its parts are sectioned to show the components consisting it.
* Mounted on a base.
* Product size : 16 x 13 x 20 cm
* Weight : 1 kg

PT-1065 Trainer

Air Conditioning Cut Model



Cutaway model of air conditioning system, showing the operation of its main parts :

* Radial piston compressor
* Condenser
* Filter
* Expansion valve
* Evaporator
* Electric fans
* High and low pressure connecting hose

Dimensions and weights (packing included) approximate:

* Dimensions: 62 x 45 x 45 cm
* Net weight : 16 kg
* Gross weight : 20 kg